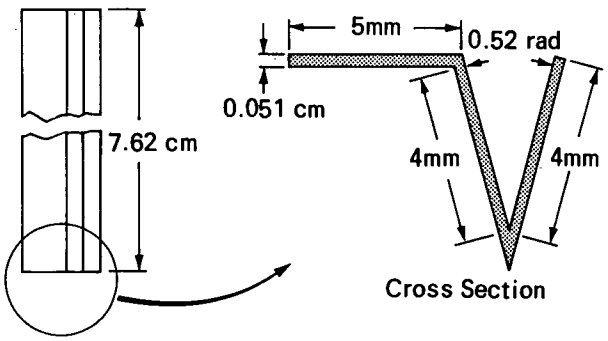
NASA TECH BRIEF

Marshall Space Flight Center

Improved Source of Infrared Radiation for Spectroscopy

The problem:

Devise an improved source of continuous, intense infrared radiation for high-resolution spectroscopy.



Details of the Element

The solution:

Crimp a V-groove in the electrically heated metallic element. Radiation from such a groove was found to be more intense than that from plane areas adjacent to the element.

How it's done:

The experimental element was a ribbon of molybdenum, 7.62 cm (3 in.) long by 0.051 cm (0.020 in.) thick. Crimped along the length of the ribbon, adjacent to a 5 mm wide flat (see fig.) was a vee, 4 mm deep with an internal angle of 0.52 rad (30 deg). The element was heated by 1.5 V, 200 A ac (limited by available power). Element degradation was prevented by operating in a partial vacuum of 1.3 to 0.13 mN/m^2 (10^{-5} to 10^{-6} torr) in a bell jar of borosilicate glass (17 cm high, 7.5 cm I.D.). The flange between the jar and the diffusion pump immediately below the jar was part of a precisely adjustable table that enabled focusing different areas of the element on the entrance slit of a spectrograph. During operation, a potassium bromide window (75 mm diam, 9 mm thick) in a water-cooled holder was sealed to the front of the jar.

The sealed lid was a water-cooled copper plate containing the mounting assembly of the metallic element. The stainless steel holders of the element were bolted to water-cooled copper conductors entering through the lid, and were machined to accommodate the vee and flat so as to maximize the area of contact between the element and the holders. One conductor was insulated from the lid, the other was fitted with a variable-tension device to prevent the element from buckling as it heated and expanded.

The radiation from the vee and from the flat was compared by alternately focusing them on the entrance slit of a spectrograph. An element in the as-supplied condition was used for measurements with the entire element in place. Other measurements were taken through a modified technique in which the flat and the vee were inserted individually and observed. In addition, some elements were heated to 1693°K (1420°C) prior to testing.

Preliminary results show that the radiation from the vee is more intense than from the other surfaces, but further experimentation is required before more definitive conclusions can be drawn.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Code A&TS-TU
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Reference: TSP71-10031

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

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